



## CICEET

*Serving the technology needs of coastal managers*

### About CICEET

Established in 1997, the Cooperative Institute for Coastal and Estuarine Environmental Technology (CICEET) is a partnership of the National Oceanic and Atmospheric Administration (NOAA) and the University of New Hampshire (UNH). Through strategic partnerships and direct investments, CICEET develops tools for clean water and healthy coasts nationwide. CICEET's toolkit contains dozens of field ready technologies—with many more in the pipeline—that address coastal resource problems in three ways:

- **Detection: tools to detect pollution**

CICEET has sponsored the development of a wide range of sensors, microbial rapid detection methods, Harmful Algal Bloom (HAB) detection and identification, and technologies to collect, relay, and synthesize data.

- **Recovery: tools to treat pollution and restore habitats**

These include technologies to restore and protect shorelines, such as a multi-beam bathymetric model to map the ocean floor in high energy coastal environments, *in situ* sediment remediation technologies, and predictive models and methods for seagrass and saltmarsh restoration.

- **Prevention: tools to prevent the impacts of pollution**

These include a unique stormwater treatment evaluation center, methods to reduce nutrient pollution, and models to predict and prevent the impacts of land use change.

### CICEET & NERRS

Collaboration with the National Estuarine Research Reserve System (NERRS) is at the heart of CICEET's mission. The reserves' geographic and ecological diversity provides a living laboratory in which CICEET investigators develop and test effective tools for coastal managers. The local and regional networks the reserves foster are important conduits through which CICEET technologies can reach the people who need them most. At the same time, CICEET supports the goals of the reserves and addresses the needs of the communities they serve.

Here's how:

- **Key Infrastructure:** CICEET invests in the equipment needs of the NERRS, including datalogger upgrades to YSI's extended deployment system, the purchase and evaluation of *in situ* YSI fluorimeters, and computers to support the GIS capability at every reserve.

- **SWMP Support:** CICEET is an engaged partner in the NERRS System-Wide Monitoring Program (SWMP), part of the national backbone of IOOS, the Integrated Ocean Observing System. Since 1998, CICEET has invested \$2,007,736 in SWMP-related infrastructure and technology demonstration and evaluation projects. CICEET also supports the training of reserve personnel in monitoring-related technologies, and contributes to the NERRS' ability to provide timely and accurate water quality data.
- **Needs Assessment:** CICEET works with the NERRS to define the priority technology needs of their local coastal resource managers. These assessments help CICEET design competitive funding programs that focus the expertise of leading researchers on the development, demonstration, and application of innovative tools for coastal management.
- **Focus on NERRS:** CICEET brings the talents of leading researchers to bear on the development of technology to address issues related to the NERRS mission. Every project funded by CICEET's Environmental Technology Development Program (ETD) must have a connection—through research, technology development, demonstration, or outreach—to a NERRS site or its watershed. NERRS personnel often serve as advisors or primary investigators for CICEET projects.
- **Serving NERRS Customers:** CICEET's partnership with the NERRS Coastal Training Program (CTP) helps bridge the distance between available tools and the coastal managers who need them, through outreach, training, and communications materials. For example, the CICEET-sponsored UNH Stormwater Center is a resource for CTP coordinators engaged in helping land use decision makers develop stormwater management programs to protect water quality.

### Learn more

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Tools for Clean Water & Healthy Coasts



## CICEET & Massachusetts

The Waquoit Bay National Estuarine Research Reserve spans more than 2,500 acres of open waters, barrier beaches, marshlands, and uplands on the south shore of Cape Cod. The reserve coordinates research, education, and stewardship programs to promote better understanding and management of Massachusetts' coasts.

The reserve also is a living laboratory for CICEET-sponsored scientists who test solutions to the challenges that coastal resource managers face in a rapidly developing landscape. These research scientists and technology innovators develop tools to prevent or reduce the impacts of development on fragile coastal ecosystems that are important economic and cultural resources for the state.



### Investing in Massachusetts

Since 1998, CICEET has invested nearly \$3 million in technology development and application projects in Massachusetts' Waquoit Bay. Many of these projects address the priority needs of Massachusetts' coastal resource managers. A particular focus has been the widespread problem of nitrogen pollution, which commonly enters the region's groundwater and estuaries from fertilizer and wastewater. Here are some examples:

**Groundwater Low-down:** Groundwater collects nutrients such as nitrogen and phosphorous as it moves through soil and sediment and then carries these pollutants to coastal waters. Measuring groundwater discharge to assess its impact has been a time-consuming and labor-intensive process. Two grants from CICEET have led to a new automated seepage meter that delivers time-series measurements of groundwater discharge, including the nitrate composition, salinity, and flow rate of groundwater as it enters coastal waterways. It will be commercially available through YSI International in 2007.

**Online Natural Resource-based Planner:** To integrate natural resource protection into the planning and development process, communities need information, education, and fast, inexpensive, and relatively low-tech tools. This project is enhancing a GIS-based community resource inventory with specific coastal habitat and resource data, and developing an online interactive version of the tool to improve and expand its accessibility.

**SPARROW Takes Off:** Nitrogen loading has effected water quality in more than 40 percent of U.S. estuaries, and in New England, the damage has been especially severe. The SPARROW (Spatially Referenced Regressions on Watershed Attributes) Water Quality Model helps coastal managers estimate nutrient levels in freshwater streams, nutrient loading to coastal waters, and nutrient sources. This project has packaged SPARROW in an easy-to-use and accessible web format.

**Into Thin Air:** Septic systems remove only about 23 percent of nitrogen from household wastewater; the rest flows into groundwater and surface waters. This project developed a low-cost, eco-friendly method of removing nitrogen from septic system wastewater. It uses sulfur pellets, crushed oyster shells, and bacteria to convert nitrate into harmless nitrogen gas—removing up to 90 percent of available nitrate. Researchers are working with a private company to demonstrate the product's effectiveness and lay the groundwork for regulatory approval.

**Copper Tracker:** Despite tight regulations, copper enters coastal waters from marine antifouling paint, treated lumber, municipal waste, and stormwater runoff. Even small amounts of copper can be toxic to many important species of marine fish and shellfish, including flounder, Eastern oyster, soft-shell clam, and lobster. Remediation depends on the ability to monitor copper levels quickly, cost-effectively and accurately. This project is developing a cost-effective fluorescence-based biosensor technology that can monitor free copper ions in estuarine waters in real time.

**Monitoring Heavy Metals:** Heavy metals like lead routinely wash into coastal waters and estuaries from urban and industrial sources. Obtaining quick, accurate measurements to assess the presence of heavy metal ions in marine waters is critical to successful remediation. This project developed a probe that measures free ion concentrations of copper and lead in marine environments.

### Learn more

For more information on these tools, contact Dolores Leonard at CICEET:  
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For more information on this reserve, visit:  
[nerrs.noaa.gov/Waquoit Bay](http://nerrs.noaa.gov/Waquoit Bay)

<http://ciceet.unh.edu>

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